better accuracy than a factor of two is implied. Turbulent motions of a random direction superimposed on a steady rotational velocity of the same magnitude or less would present a confusing appearance. Since the cloud motions were confused in the central core of the funnel, out to an estimated average fractional radius of 20 percent, the best guess for the mean magnitude of the turbulent component of velocity is 40 kt.

A sudden drop in surface atmospheric pressure also accompanied the funnel cloud. Just before entering the radar operations building we observed, through a window in the closed door, many fine particles like insulating material flying about inside the building. We believe that these particles were separated from the interior walls and ceiling of the building by an intense atmospheric pressure gradient. The strong southwest winds were still blowing at this time. Also, we learned later that many steel plates (approximately 40 in. x 24 in. x ½ in.) covering the exterior cable ducts were popped off, presumably by sudden pressure drop because only the thin edge is exposed to the wind. According to hearsay evidence, the latter event also occurred during high southwest winds, several seconds before a short period of calm, which was followed in turn by strong winds from the northwest. Unfortunately, no barometric or wind measurements were available. However, the two bits of evidence indicate the occurrence of a maximum pressure gradient at least a few seconds before the wind calmed.

In summary, the most striking features of our observation, which we also believe to be most reliable, are: (1) the location of the tornado a short distance east of pronounced mammata; (2) approximately constant angular velocity of cloud fragments throughout the funnel in combination with violent turbulent motions which were, however, considerably less than peripheral funnel speed; and (3) high surface winds continuing for at least several seconds after the occurrence of a sharp maximum in the gradient of falling atmospheric pressure.

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Weather Note

UNUSUAL TORNADO PHOTOGRAPHS

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In years past, the obtaining of a photograph of a tornado in action was a rather rare event. In more recent times, individual tornado photographs became more commonplace and sequential pictures of a tornado became the prized item. At present, as a result of the increased population and the universal popularity of amateur photography, multiple serial photographs of single tornadoes are not uncommon, at least in meteorological research circles. Currently, particular phases of the tornado sequence become the rare photograph.

The beginning tornado has rarely been photographed simply because the photographer, amateur or professional, has not known whether or not a tornado was going to develop from a storm or, generally, from what part of the storm it might come. Two very unusual beginning tornado pictures recently came to the attention of the writer. They were taken in color by Mr. C. Y. Byrd, III, of Tampa, Fla., on July 28, 1963, and were submitted by Mr. L. M. Dye, of the Weather Bureau Office at Tampa.

These photographs (figs. 1a, b) are shown in the order in which they appear to have been taken. The central lobe and circular cloud bands definitely suggest rotation of the cloud system. The degree of ellipticity, assuming that the bands were truly circular, suggests that the formation was nearly overhead when the initial photograph was taken. Mr. Dye describes the event, as follows, in a letter sent with the pictures:

"The storm from which this tornado developed was moving westward across the land area of the City of Tampa known as Palm Ceia, which is a strip of land between Hillsborough Bay and Old Tampa Bay. The funnel cloud had not touched the ground when the pictures were taken. Just before the pictures were taken the sun was shining. The funnel cloud touched the ground shortly after the pictures were taken and traveled in a northeast-southwest line toward the southwest. Rain began shortly after he took the pictures and prevented Mr. Byrd from seeing the tornado. The rain at Mr. Byrd's home lasted only 3–4 minutes. He stated that the main part of the storm was north of him. From a survey made, the damage consisted of 2 roofs damaged on houses; a few trees down, some falling on cars; and some damage to an outdoor laundry. Total damage was estimated to be $10,000."

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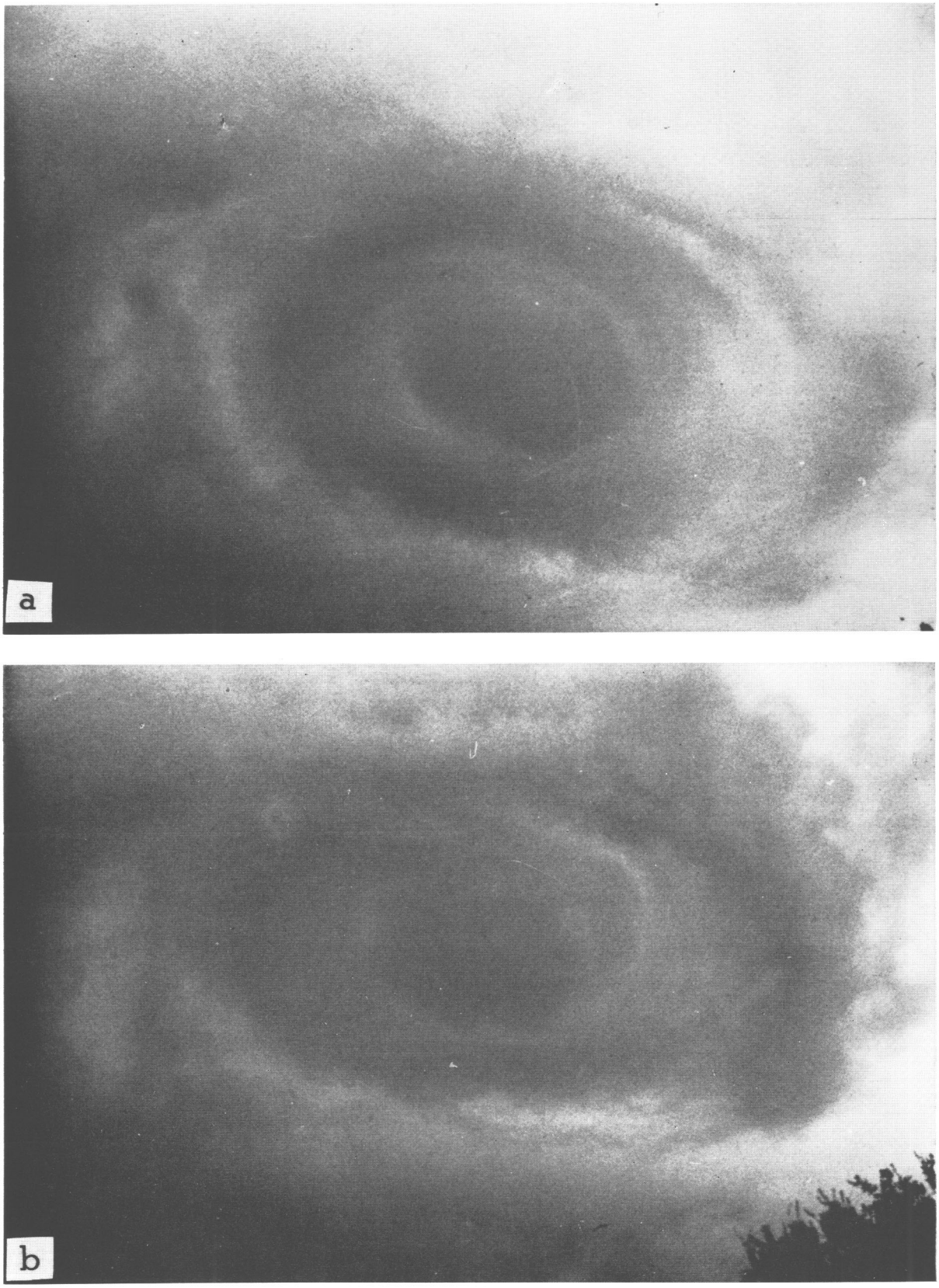

FIGURE 1.—Two very unusual photographs of the beginning of a tornado at Tampa, Fla., on July 28, 1963. (a) and (b) are in the order in which they appear to have been taken. The views are from nearly beneath the tornado cloud. A few minutes after the photographs, the tornado dipped to the ground and damaged trees and roofs. These pictures were taken by Mr. C. Y. Byrd III, of Tampa and are reproduced here with his permission.